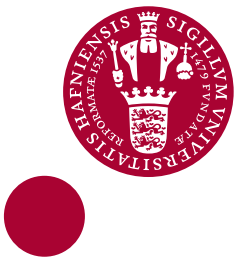

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Sedimentation of helminth eggs in low quality water to be used for irrigation in agriculture

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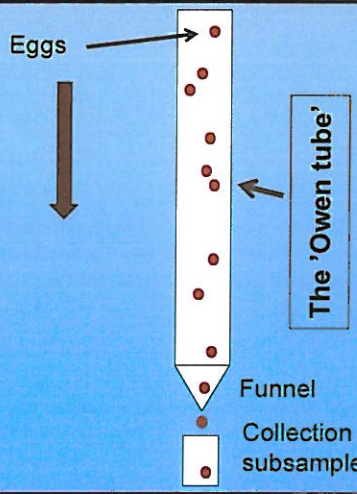
INTRODUCTION

- Irrigation with low quality water in agriculture is increasing worldwide due to water shortage. Low quality water often contains pathogens like eggs of helminth parasites and irrigation with such water may therefore negatively affect food safety, and health of humans and animals.
- Sedimentation of particles, including eggs, is expected to follow Stoke's law, which implies that sedimentation velocity depends on particle size, differences in density between particles and water, and the viscosity of water.
- The present study aimed to experimentally determine the sedimentation velocity of helminth eggs in tap and waste water.

METHOD

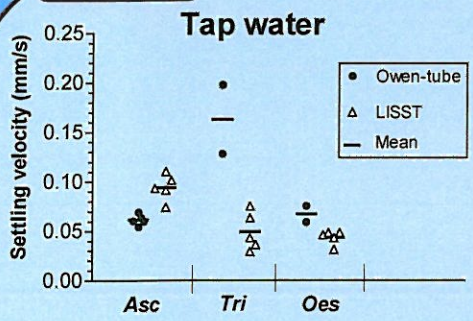


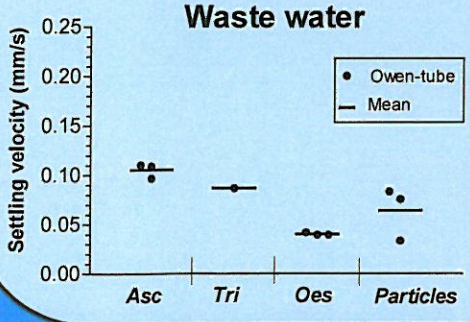
- Eggs of *Oesophagostomum* sp., *Ascaris suum* and *Trichuris suis* were recovered from pig faeces by sieving and flotation.
- 'Owen tubes' were filled with 2L of either tap water or inlet water from a sewage plant (dry matter content of 1860 mg/L), and added 500-600 eggs of each helminth.
- 10 sub-samples (200ml) were collected at varying time intervals (4 min to 22 hrs) from the bottom of the Owen tube and the number of eggs was counted.
- Settling velocity was also determined by means of 'Laser In-Situ Scattering and Transmissometry' (LISST).

Stoke's Law: $V_s = g/18 \times d^2 \times (\rho_p - \rho_l) \times \eta^{-1}$

g is gravitational acceleration (9.81 m s-2)
d is particle diameter (m)
ρ_p is specific density of the particles
ρ_l is specific density of the liquid
η is dynamic viscosity of the liquid.

RESULTS





- According to size and density, *Trichuris* eggs were expected to sediment at the fastest rate followed by *Ascaris* and *Oesophagostomum* spp. This was confirmed by the Owen-tube method in tap water but not by LISST.
- The settling velocity for *Ascaris* was faster in waste water as compared to tap water. Most likely because eggs are trapped in large sized flocculated particles which have a faster settling rate.
- In contrast, eggs of *Trichuris* and *Oesophagostomum* spp. seemed to be unaltered/ slowed down in waste water.
- In general, the sedimentation rate is slow for all 3 egg types and if there is a water flow the eggs will not sediment, but be transported along with the water.

CONCLUSION

- It was possible to determine the settling velocity of eggs of 3 different helminths in tap and waste water. Sedimentation is slow compared to in-organic particles.
- Particles in waste water influence the settling velocity of eggs but not in a uniform way.
- The results will form basis for improved sanitation of low quality irrigation water.

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